
PART I.

THE FOREST TREES OF NORTH AMERICA,
EXCLUSIVE OF MEXICO.

THE FORESTS OF NORTH AMERICA.

GENERAL REMARKS.

The North American continent, or that part of it situated north of Mexico, which will alone be considered here, may be conveniently divided, with reference to its forest geography, into the Atlantic and the Pacific regions, by a line following the eastern base of the Rocky mountains and its outlying eastern ranges from the Arctic circle to the Rio Grande. The forests which cover these two divisions of the continent differ as widely, in natural features, composition, and distribution, as the climate and topography of eastern America differ from the climate and topography of the Pacific slope. The causes which have produced the dissimilar composition of these two forests must be sought in the climatic conditions of a geological era earlier than our own and in the actual topographical formation of the continent; they need not be discussed here.

The forests of the Atlantic and the Pacific regions, dissimilar in composition in the central part of the continent, are united at the north by a broad belt of subarctic forests extending across the continent north of the fiftieth degree of latitude. One-half of the species of which this northern forest is composed extends from the Atlantic to the Pacific; and its general features, although differing east and west of the continental divide, in conformity with the climatic conditions peculiar to the Atlantic and the Pacific sides of the continent, still possess considerable uniformity. The forests of the Atlantic and the Pacific regions are also united at the south by a narrow strip of the flora peculiar to the plateau of northern Mexico, here extending northward into the United States. Certain characteristic species of this flora extend from the gulf of Mexico to the shores of the Pacific, and while the peculiar features of the eastern and the western slopes of the interior mountain system of the continent are still maintained here, the Atlantic and the Pacific regions of the Mexican forest belt possess many general features in common. Typical North American species, moreover, peculiar to the forests of the Atlantic or of the Pacific, mingle upon the Black hills of Dakota, and upon the Guadalupe and other mountains of western Texas, the extreme eastern ridges of the Rocky Mountain range, and the outposts between the Atlantic and the Pacific regions.

THE ATLANTIC REGION.

The forests of the Atlantic region may be considered under six natural divisions: the Northern Forest, the Northern Pine Belt, the Southern Maritime Pine Belt, the Deciduous Forest of the Mississippi Basin and the Atlantic Plain, the Semi-tropical Forest of Florida, and the Mexican Forest of Southern Texas (Map No. 2, portfolio).

These natural divisions, although composed in part of species found in other divisions and possessing many general features in common, are still for the most part well characterized by predominant species or groups of species, making such a separation natural and convenient.

The *Northern Forest* stretches along the northern shores of Labrador nearly to the sixtieth degree of north latitude, sweeps to the south of Hudson bay, and then northwestward to within the Arctic circle. This Northern Forest extends southward to the fiftieth degree of north latitude on the Atlantic coast, and nearly to the fifty-fourth degree at the 100th meridian. It occupies 10 degrees of latitude upon the Atlantic sea-board and nearly 20 degrees in its greatest extension north and south along the eastern base of the Rocky mountains. The region occupied by this Northern Forest, except toward its southwestern limits, enjoys a copious rainfall; it is divided by innumerable streams and lakes, and abounds in swampy areas often of great extent. The nature of the surface and the low annual mean temperature check the spread of forest growth and reduce the number of arborescent species, of which this forest is composed, to eight; of these, four cross to the Pacific coast, while the remainder, with a single exception, are replaced west of the continental divide by closely allied forms of the Pacific forest. The white and the black spruces are characteristic trees of this region; they form an open, stunted forest upon the low divides of the

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water-sheds, and reach a higher latitude than any other arborescent species of the continent; the valleys and wide bottoms are clothed with broad sheets of poplars, dwarf birches, and willows. The forest of this entire region is scattered, open, stunted, and of no great economic value. It embraces, south of the sixtieth degree of north latitude, the northern extension of the great midcontinental plateau, which will be considered hereafter.

South of the Northern Forest the *Northern Pine Belt* extends from the Atlantic coast to the ninety-sixth meridian of longitude; east of the Appalachian Mountain system it extends south over nearly 6 degrees of latitude, with a long, narrow spur following the higher Alleghany ridges for nearly 3 degrees farther south; west of the Alleghany mountains, in the region of the great lakes, the pine forest is replaced south of the forty-third degree of latitude by the deciduous growth of the Mississippi basin. This second division of the Atlantic forest may be characterized by the white pine (*Pinus Strobus*), its most important, if not its most generally-distributed, species. East of the Appalachian system this tree often forms extensive forests upon the gravelly drift plain of the Saint Lawrence basin, or farther south and west appears in isolated groves, often of considerable extent, scattered through the deciduous forest. Forests of black spruce are still an important feature of this region, especially at the north, and within its boundaries the hemlock, the yellow cedar, the basswood, the black and the white ash, the sugar maple, and several species of birch and elm find their northern limits and the center of their most important distribution. The hickories and the oaks, characteristic features of the deciduous forests of all the central portion of the Atlantic region, reach here the northern limits of their distribution, as do the chestnut, the sassafras, the tulip tree, the magnolia, here represented by a single species, the red cedar, the tupelo, the sycamore, the beech, and other important genera.

The *Southern Maritime Pine Belt* extends from the thirty-sixth degree of north latitude along the coast in a narrow belt, varying from one hundred to two hundred miles in width, as far south as cape Malabar and Tampa bay; it stretches across the Florida peninsula and along the coast of the gulf of Mexico until the alluvial deposits of the Mississippi are encountered; it reappears west of that river in Louisiana, north and south of the Red river, and here gradually mingles with the deciduous forests of the Mississippi basin in Arkansas and eastern Texas. This belt is well characterized by the almost continuous growth, outside of the broad river bottoms and the immediate neighborhood of the coast, by the open forest of the long-leaved pine (*P. palustris*). The live oak, the palmetto, and various species of pine characterize the coast forest of this region; through the river bottoms and along the borders of the shallow ponds, scattered through the pine forest, different gums, water oaks, hickories, and ashes attain noble dimensions. The southern cypress (*Taxodium*), although extending far beyond the limits of this natural division, here attains its greatest development and value, and, next to the long-leaved pine, may be considered the characteristic species of the maritime pine belt.

The *Deciduous Forest of the Mississippi Basin and the Atlantic Plain* occupies, with two unimportant exceptions to be considered hereafter, the remainder of the Atlantic region. Through this deciduous forest, where peculiar geological features have favored the growth of *Coniferae*, belts of pine, growing gregariously or mixed with oaks and other broad-leaved trees, occur, especially upon some portions of the Atlantic plain and toward the limits of the Southern Maritime Pine Belt, west of the Mississippi river. The characteristic features of the forest of this whole region are found, however, in the broad-leaved species of which it is largely composed. Oaks, hickories, walnuts, magnolias, and ashes give variety and value to this forest, and here, with the exception of a few species peculiar to a more northern latitude, the deciduous trees of the Atlantic region attain their greatest development and value. Upon the slopes of the southern Alleghany mountains and in the valley of the lower Red river, regions of copious rainfall and rich soil, the deciduous forest of the continent attains unsurpassed variety and richness. Upon the Alleghany mountains northern and southern species are mingled, or are only separated by the altitude of these mountains; rhododendrons, laurels, and magnolias, here attaining their maximum development, enliven the forests of northern pines and hemlocks which clothe the flanks of these mountains or are scattered through forests of other broad-leaved species. The cherry, the tulip tree, and the chestnut here reach a size unknown in other parts of the country. The forest of the Red River valley is hardly less varied. The northern species which the elevation of the Alleghany mountains has carried south are wanting, but other species peculiar to the southern Atlantic and Gulf coasts are here mingled with plants of the southern deciduous forest. The seven species of *Carya* (the hickories) are nowhere else closely associated. A great variety of the most important oaks grow here side by side; here is the center of distribution of the North American hawthorns, which do not elsewhere attain such size and beauty. The osage orange is peculiar to this region; the red cedar, the most widely distributed of American *Coniferae*, the southern and the yellow pine (*Pinus palustris* and *mitis*) here reach their best development. Just outside of this region, upon the "bluff" formation of the lower Mississippi valley and of western Louisiana, the stately southern magnolia, perhaps the most beautiful of the North American trees, and the beech assume their greatest beauty, and give a peculiar charm to this southern forest.

The western third of the Atlantic region is subjected to very different climatic conditions from those prevailing in the eastern portion of the continent; it consists of an elevated plateau which falls away from the eastern base of the Rocky mountains, forming what is known as the Great Plains. This great interior region, on account of its remoteness from natural reservoirs of moisture, receives a meager and uncertain rainfall, sufficient to insure a growth of herbage, but not sufficient to support, outside the narrow bottoms of the infrequent streams, the scantiest

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forests. This treeless plateau extends north to the fifty-second degree of north latitude; it follows southward the trend of the Rocky mountains far into Mexico, extending eastward at the point of its greatest width, in about latitude 40° N., nearly to the ninety-seventh meridian. This whole region is generally destitute of forest. The narrow bottoms of the large streams are lined, however, with willows, poplars, elms, and hackberries, trees adapted to flourish under such unfavorable conditions. These diminish in size and number with the rainfall, and often disappear entirely from the banks of even the largest streams toward the western limits of the plateau, south of the forty-fifth degree of latitude. North and east of these central treeless plains a belt of prairie extends from the sixtieth degree of north latitude to southern Texas. The average width east and west of this prairie region, through much of its extent, is not far from 150 miles. Its eastern extension, between the fortieth and forty-fifth degrees of latitude, is much greater, however, here reaching the western shores of lake Michigan, and forming a great recess in the western line of the heavy forest of the Atlantic region with a depth of nearly 600 miles. The transition from the heavy forest of the eastern and central portions of the Atlantic region to the treeless plateau is gradual. The change occurs within the prairie region. Here is the strip of debatable ground where a continuous struggle between the forest and the plain takes place. There is here sufficient precipitation of moisture to cause, under normal conditions, a growth of open forest, but so nicely balanced is the struggle that any interference quickly turns the scale. Trees planted within this prairie belt thrive if protected from fire and the encroachment of the tough prairie sod, and so extend the forest line westward; if the forest which fringes the eastern edge of the prairie is destroyed it does not soon regain possession of the soil, and the prairie is gradually pushed eastward.

The eastern line of the plain where arborescent vegetation is confined to the river bottoms, and which divides it from the prairie where trees grow naturally, to some extent, outside of the bottoms, and where they may be made to grow under favorable conditions everywhere, is determined by the rainfall enjoyed by this part of the continent. The extreme eastern point reached by this line is found, upon the fortieth degree of north latitude, near the northern boundary of the state of Kansas. North of the fortieth degree it gradually trends to the west, reaching the eastern base of the Rocky mountains in about latitude 52°. This northwestern trend of the eastern plain line may be ascribed to the comparatively small evaporation which takes place during the shorter summer of the north and to a slight local increase of spring and summer rainfall. South of the fortieth degree the plain line gradually trends to the southwest under the influence of the gulf of Mexico, reaching its extreme western point in Texas upon the one hundredth meridian.

Other causes, however, than insufficient rainfall and a nicely balanced struggle between the forest and the plain have prevented the general growth of trees in the prairie region east of the ninety-fifth meridian. The rainfall of this region is sufficient to insure the growth of a heavy forest. The rain falling upon the prairies of Minnesota, Wisconsin, Iowa, Illinois, and Missouri equals in amount that enjoyed by the Michigan peninsula and the whole region south of lakes Ontario and Erie, while prairies exist within the region of the heaviest forest growth. It is not want of sufficient heat, or of sufficient or equally distributed moisture, which has checked the general spread of forest over these prairies. The soil of which the prairies are composed, as is shown by the fact that trees planted upon them grow with vigor and rapidity, is not unsuited to tree growth. It is not perhaps improbable that the forests of the Atlantic region once extended continuously as far west at least as the ninety-fifth meridian, although circumstantial evidence of such a theory does not exist; and the causes which first led to the destruction of the forests in this region, supposing that they ever existed, cannot with the present knowledge of the subject be even guessed at. It is, however, fair to assume that forests once existed in a region adapted, by climate, rainfall, and soil, to produce forests, and that their absence under such conditions must be traced to accidental causes. It is not difficult to understand that the forest once destroyed over such a vast area could not easily regain possession of the soil protected by an impenetrable covering of sod and subjected to the annual burnings which have occurred down to the present time; while the force of the wind, unchecked by any forest barrier, over such an area would, even without the aid of fires, have made the spread of forest growth slow and difficult. The assumption that these eastern prairies may have once been covered with forests is strengthened by the fact that since they have been devoted to agriculture, and the annual burning has been stopped, trees which were formerly confined to the river bottoms have gradually spread to the uplands. Small prairies situated just within the western edge of the forest have entirely disappeared within the memory of persons still living; the oak openings—open forests of large oaks through which the annual fires played without greatly injuring the full-grown trees—once the characteristic feature of these prairies, have disappeared. They are replaced by dense forests of oak, which only require protection from fire to spring into existence. In western Texas, the mesquit, forced by annual burning to grow almost entirely below the surface of the ground, is, now that prairie fires are less common and destructive, spreading over what a few years ago was treeless prairie. The prairies, then, or the eastern portions of them situated in the region of abundant rainfall, are fast losing their treeless character, and the forest protected from fire is gradually gaining in every direction; regions which fifty years ago were treeless outside the river bottoms now contain forests covering 10 or even 20 per cent. of their area. These eastern, well-watered prairies must not, however, be confounded with their dry western rim adjoining the plains—the debatable ground between forest and plain—or with the plains themselves. There is now no gradual, constant spread of forest growth upon the plains. They are treeless, on account of insufficient moisture to develop forest growth; and while trees may, perhaps, if planted, survive during a few years

beyond the western limits of the prairie as here laid down, the permanent establishment of forests there does not seem practicable, and, sooner or later, a period of unusual drought must put an end to all attempts at forest cultivation in a region of such insufficient and uncertain rainfall (Map No. 1, portfolio).

It remains to consider the *Semi-tropical Forest of Florida* and the *Mexican Forest of Southern Texas*.

A group of arborescent species of West Indian origin occupies the narrow strip of coast and islands of southern Florida. This belt of semi-tropical vegetation is confined to the immediate neighborhood of the coast and to occasional hummocks or islands of high ground situated in the savannas which cover a great portion of southern Florida, checking, by the nature of the soil and want of drainage, the spread of forest growth across the peninsula. This semi-tropical forest belt reaches cape Malabar on the east and the shores of Tampa bay on the west coast, while some of its representatives extend fully 2 degrees farther north. It is rich in composition; nearly a quarter of all the arborescent species of the Atlantic forest are found within this insignificant region. The semi-tropical forest, in spite of its variety, is of little economic importance. The species of which it is composed here reach the extreme northern limit of their distribution; they are generally small, stunted, and of comparatively little value. Certain species, however, attain respectable proportions; the mahogany, the mastic, the royal palm, the mangrove, the sea-grape, the Jamaica dogwood, the manchineel, and other species here become considerable and important trees.

In western and southern Texas the trees of the Mississippi basin, checked by insufficient moisture from farther extension southward outside the river bottoms, are replaced by species of the plateau of northern Mexico. The streams flowing into the gulf of Mexico are still lined, however, east of the one-hundredth meridian, with the species of the Atlantic basin, which thus reach southward to beyond the Rio Grande. The Mexican forest belt of Texas extends from the valley of the Colorado river, near the ninety-eighth meridian, to the Rio Grande. It touches the coast not far from the Nueces river and extends to the eastern base of the mountain ranges west of the Pecos; here the species of which it is composed mingle with those peculiar to the Pacific-Mexican forest. The forest of this region, like that of all countries of insufficient moisture, is open, stunted, and comparatively of little value. It is characterized by enormous areas covered with chaparral (dense and often impenetrable thickets of thorny shrubs and small trees), by a stunted and occasional arborescent growth upon the hills and plains, and by fringes of heavier timber along the river bottoms. The most valuable and perhaps the most characteristic species of this whole region, the mesquit, extends to the Pacific coast. With this exception, none of the arborescent species peculiar to this region attain any considerable size or importance, although the forest of small junipers which covers the low limestone hills of the Colorado valley are locally valuable in a country so generally destitute of trees. The region immediately adjoining the Rio Grande abounds in different species of *Acacia*, *Leucena*, and other Mexican *Leguminosae*; and farther west, upon the dry plains of the Presidio, the Spanish bayonet (*Yucca baccata*) covers wide areas with a low, open, and characteristic forest growth.

THE PACIFIC REGION.

The Pacific forest region is coextensive with the great Cordilleran Mountain system of the continent. The causes which have influenced the present position and density of these forests must be sought in the peculiar distribution of the rainfall of the region. The precipitation of moisture upon the northwest coast is unequalled by that of any other part of the continent. It gradually decreases with the latitude until, in southern California, the temperature of the land so far exceeds that of the ocean that precipitation is impossible through a large part of the year. The interior of all this great region, shut off by the high mountain ranges which face the ocean along its entire extent, is very imperfectly supplied with moisture. It is a region of light, uncertain, and unequally distributed rainfall, heavier at the north, as upon the coast, and decreasing gradually with the latitude in nearly the same proportion. This entire region is composed of a mass of mountain ranges with a general north and south trend, separating long and generally narrow valleys. The precipitation of moisture within the interior region is largely regulated by the position of the mountain chains. Warm currents ascending their sides become cold and are forced to deposit the moisture they contain. It follows that, while the interior valleys are rainless or nearly so, the mountain ranges, and especially the high ones, receive during the year a considerable precipitation of both rain and snow. If the distribution of the forests of any region is dependent upon the distribution and amount of moisture it receives, forests exceeding in density those of any other part of the continent would be found upon the northwest coast; they would gradually diminish toward the south, and entirely disappear near the southern boundary of the United States, while the forests of all the interior region, from the summit of the principal Coast Ranges to the eastern base of the Rocky mountains, would be confined to the flanks and summits of the mountains. These forests would be heavy upon the high ranges, especially toward the north; they would disappear entirely from the valleys and low mountain ranges. An examination of the forests of the Pacific region will show that in general distribution and density they actually follow the distribution of the rainfall of the region. These forests well illustrate the influence of moisture upon forest growth. Within the Pacific region the heaviest and the lightest forests of the continent coexist with its heaviest and lightest rainfall.

The forests of the Pacific region may be considered under four divisions: the Northern Forest, the Coast Forest, the Interior Forest, and the Mexican Forest (Map No. 2, portfolio).

The *Northern Forest* of the Pacific region extends from nearly the seventieth to about the fifty-eighth degree of north latitude, or, immediately upon the coast, is replaced by the Coast Forest nearly 2 degrees farther north; it extends from the continental divide, here mingled with the Northern Forest of the Atlantic region, to the shores of the Pacific. The southern limit of this open, scanty Northern Forest, composed of species which extend across the continent, or of species closely allied to those of the Northern Forest of the Atlantic region, is still imperfectly known, especially in the interior. The determination of the southern range in Alaska and British Columbia of several species, as well as the northern range here of a few others, must still be left to further exploration. The white spruce, the most important and the most northern species of the forest of the North Atlantic region, is here also the most important species. It attains a considerable size as far north as the sixty-fifth degree, forming, in the valley of the Yukon, forests of no little local importance. The canoe-birch, the balsam poplar, and the aspen, familiar trees of the North Atlantic region, also occur here. The gray pine and the balsam fir of the Atlantic region are replaced by allied forms of the same genera. The larch alone, of the denizens of the extreme Northern Forest of the Atlantic coast, finds no congener here in the northern Pacific forest.

The *Pacific Coast Forest*, the heaviest, although far from the most varied, forest of the continent, extends south along the coast in a narrow strip from the sixtieth to the fiftieth parallel; here it widens, embracing the shores of Puget sound and extending eastward over the high mountain ranges north and south of the boundary of the United States. This interior development of the Coast Forest, following the abundant rainfall of the region, is carried northward over the Gold, Selkirk, and other interior ranges of British Columbia in a narrow spur extending north nearly to the fifty-fourth parallel. It reaches southward along the Cœur d'Alêne, Bitter-Root, and the western ranges of the Rocky Mountain system to about latitude 47° 30', covering northern Washington territory, Idaho, and portions of western Montana.

The Coast Forest south of the fiftieth degree of latitude occupies the region between the ocean and the eastern slopes of the Cascade Range; in California the summits of the principal southern prolongation of these mountains, the Sierra Nevada, marks the eastern limits of the Coast Forest, which gradually disappears south of the thirty-fifth parallel, although still carried by the high ridges of the southern Coast Range nearly to the southern boundary of the United States. The Coast Forest, like the forests of the whole Pacific region, is largely composed of a few coniferous species, generally of wide distribution. The absence of broad-leaved trees in the Pacific region is striking; they nowhere form great forests as in the Atlantic region; when they occur they are confined to the valleys of the coast and to the banks of mountain streams, and, economically, are of comparatively little value or importance. The characteristic and most valuable species of the northern Coast Forest are the Alaska cedar (*Ohmacypparis*), the tide-land spruce, and the hemlock. These form the principal forest growth which covers the ranges and islands of the coast between the sixty-first and the fiftieth parallels. Other species of the Coast Forest reach here the northern limits of their distribution, although the center of their greatest development is found farther south.

The red fir (*Pseudotsuga*), the most important and widely-distributed timber tree of the Pacific region, reaches the coast archipelago in latitude 51°; farther inland it extends fully 4 degrees farther north, and in the region of Puget sound and through the Coast Forest of Washington territory and Oregon it is the prevailing forest tree. The characteristic forest of the northwest coast, although represented by several species extending south as far as cape Mendicino, near the fortieth parallel, is replaced south of the Rogue River valley by a forest in which forms peculiar to the south rather than to the north gradually predominate. The forest of the northwest coast reaches its greatest density and variety in the narrow region between the summits of the Cascade Range and the ocean. North of the fifty-first parallel it gradually decreases in density, and south of the forty-third parallel it changes in composition and character. This belt of Coast Forest is only surpassed in density by that of some portions of the redwood forest of the California coast. The red fir, the great tide-land spruce, the hemlock, and the red cedar (*Thuja*) reach here enormous dimensions. The wide river bottoms are lined with a heavy growth of maple, cottonwood, ash, and alder, the narrow interior valley with an open growth of oak. In this great coniferous forest the trunks of trees two or three hundred feet in height are often only separated by the space of a few feet. The ground, shaded throughout the year by the impenetrable canopy of the forest, never becomes dry; it is densely covered by a thick carpet of mosses and ferns, often of enormous size. The more open portions of this forest are choked by an impenetrable growth of various *Vaccinea* of almost arborescent proportions, of hazel, the vine-maple, and other shrubs. The soil which has produced the maximum growth of forest in this region is, outside the river bottoms, a thin, porous gravel of glacial origin, rarely more than a few inches in depth; the luxuriance of vegetable growth, therefore, illustrates the influence of a heavy rainfall and temperate climate upon the forest.

The general character of this forest in the interior, although composed largely of the species peculiar to the coast, differs somewhat from the Coast Forest proper in composition and largely in natural features. The dense, impenetrable forest of the coast is replaced, east of the summit of the Cascade Range, by a more open growth, generally largely destitute of undergrowth. The red fir, the hemlock, and the red cedar (*Thuja*) are still important elements of the forest. Less valuable species of the Coast Forest—the white fir (*Abies grandis*), the yew, the alders, the mountain hemlock (*Tsuga Pattoniana*), the hawthorn, the buckthorn, and the white pine (*Pinus monticola*)—are still represented. The latter, a local species upon the coast, only reaches its greatest development toward the eastern limit of this region, here forming considerable and important forests. Other species peculiar to the Coast Forest, the maples, the ash, the oak, the arbutus, and the Alaska cedar, do not extend east of the Cascades. The tide-

land spruce is replaced by an allied species of the interior region. The widely-distributed yellow pine (*Pinus ponderosa*), barely represented in the northern portions of the immediate Coast Forest, becomes east of the mountains one of the most important and characteristic elements of the forest. The Coast Forest south of the forty-third degree of latitude changes in composition. The tide-land spruce, the hemlock, and the *Thuja* are gradually replaced by more southern species. The sugar pine (*P. Lambertiana*) here first appears. The California laurel (*Umbellularia*) covers with magnificent growth the broad river bottoms. The *Libocedrus*, several oaks, and the chinquapin here reach the northern limits of their distribution. The change from the northern to the southern forest is marked by the appearance of the Port Orford cedar (*Chamaecyparis Lawsoniana*), adding variety and value to the forests of the southern Oregon coast. Farther south, near the northern boundary of California, the redwood forests (*Sequoia*) appear.

The Coast Forest of California will be most conveniently discussed under three subdivisions: the forest of the Coast Range, the forest of the western slope of the Sierra Nevada, which, toward the northern boundary of the state, extends to the coast, covering the mass of mountains which here unite the Sierra Nevada and the Coast Range; and, third, the open forest of the long, narrow valleys lying between the Coast Range and the Sierra Nevada, south of this northern connection. The important feature of the Coast Range, as far south as the thirty-seventh degree of latitude, is the belt of redwood occupying an irregular, interrupted strip of territory facing the ocean, and hardly exceeding thirty miles in width at the points of its greatest development. The heaviest growth of the redwood forest occurs north of the bay of San Francisco, and here, along the slopes and bottom of the narrow cañons of the western slope of the Coast Range, the maximum productive capacity of the forest is reached. No other forest of similar extent equals in the amount of material which they contain the groups of redwood scattered along the coast of northern California. The red fir reaches, in the California Coast Range, a size and value only surpassed in the more northern forests of the coast; the yellow pine is an important tree in the northern portions of this region, and here flourish other species of the genus endemic to this region. The forest of the Coast Range is marked by the presence within its limits of several species of singularly restricted distribution. *Opuntia macrocarpa* and *Pinus insignis* are confined to a few isolated groves upon the shores of the bay of Monterey; *Abies bracteata* occupies three or four cañons high up in the Santa Lucia mountains; it is found nowhere else; and *Pinus Torreyana*, the most local arborescent species of North America, has been detected only in one or two small groups upon the sand-dunes just north of the bay of San Diego. The characteristic forest of the Coast Range is checked from farther southern development, a little below the thirty-fifth parallel, by insufficient moisture; the scanty forests which clothe the high declivities of the Coast Range farther south belong in composition to the Sierra forests.

The heavy forest which covers the western slopes of the Sierra Nevada, a forest only surpassed in density by the redwood belt of the coast and the fir forest of Puget sound, occupies, in its greatest development, a belt situated between 4,000 and 8,000 feet elevation. This forest belt extends from about the base of mount Shasta at the north to the thirty-fifth parallel; farther south it diminishes in density and disappears upon the southern ridges of the Coast Range just north of the southern boundary of California. Its greatest width occurs in northern California, where to the south of mount Shasta the Sierra system is broken down into a broad mass of low ridges and peaks. The characteristic species of this forest is the great sugar pine (*P. Lambertiana*), which here reaches its greatest development and value, and gives unsurpassed beauty to this mountain forest. With the sugar pine are associated the red fir, the yellow pine, two noble *Abies*, the *Libocedrus*; and, toward the central part of the state, the great *Sequoia*, appearing first in small isolated groups, and then, farther south, near the headwaters of Kern river, in a narrow belt extending more or less continuously for several miles. This heavy forest of the Sierras, unlike the forest which farther north covers the western flanks of the Cascade Range, is almost destitute of undergrowth and young trees. It shows the influence of a warm climate and unevenly distributed rainfall upon forest growth. The trees, often remote from one another, have attained an enormous size, but they have grown slowly. Above this belt the Sierra forest stretches upward to the limits of tree growth. It is here subalpine and alpine in character and of little economic value. Different pines and firs, the mountain hemlock, and the western juniper are scattered in open stretches of forest upon the high ridges of the Sierras. The forest below the belt of heavy growth gradually becomes more open. Individual trees are smaller, while the number of species increases. The small pines of the upper foot-hills are mingled with oaks in considerable variety. These gradually increase in number. Pines are less frequent and finally disappear.

The forest of the valleys is composed of oaks, the individuals often widely scattered and of great size, but nowhere forming a continuous, compact growth. The Coast Forest of the Pacific region, unsurpassed in density, is composed of a comparatively small number of species, often attaining enormous size. It presents the same general features throughout its entire extent, except as modified by the climatic conditions of the regions which it covers. The species which compose this forest range through nearly 26 degrees of latitude, or northern species, are replaced in the south by closely allied forms; and, as in the Atlantic region, the southern species far exceed in number those peculiar to the north.

The *Interior Forest* extends from the southern limits of the northern subarctic forest to the plateau of northern Mexico; it occupies the entire region between the eastern limits of the Pacific Coast Forest and the extreme western limits of the Atlantic region. The forests of this entire region, as compared with the forests east and west of it, are stunted and remarkable in their poverty of composition. They are confined to the high slopes

and cañons of the numerous mountain ranges composing the interior region, while the valleys are treeless, or, outside of the narrow river bottoms, nearly treeless. The interior forest attains its greatest development and considerable importance upon the western slope of the California Sierras and upon the flanks of the high peaks of the southern Rocky Mountain system, from Colorado, where the timber line reaches an extreme elevation of 13,500 feet, to southern New Mexico and western Arizona. The minimum in North American forest development, outside the absolutely treeless regions, both in the number of species and in the proportion of forest to entire area, is found south of the Blue mountains of Oregon, in the arid region between the Wahsatch mountains and the Sierra Nevada, known as the Great Basin. Here the open, stunted forest is confined to the highest ridges and slopes of the infrequent cañons of the low mountain ranges which occupy, with a general north and south trend, this entire region. The individuals which compose this forest are small, although often of immense age, and everywhere show the marks of a severe struggle for existence. Seven arborescent species only have been detected in the forests of the northern and central portions of this region. The mountain mahogany (*Cercocarpus*), the only broad-leaved species of the region, with the exception of the aspen, which throughout the entire interior region borders, above an elevation of 8,000 feet, all mountain streams, reaches here its greatest development. This tree, with the nut pine (*Pinus monophylla*), characterizes this region. Stunted junipers are scattered over the lowest slopes of the mountains, or farther south often cross the high valleys, and cover with open growth the *mesas*, as the lower foot-hills are locally known. An open forest of arborescent yuccas (*Yucca brevifolia*) upon the high Mojave plateau is a characteristic and peculiar feature of the flora of this interior region. The red fir and the yellow pine, widely distributed throughout the Pacific region, do not occur upon the mountain ranges of the Great Basin.

The heavy forests of the interior region, found along the western slopes of the California Sierras and upon the Rocky Mountain system, are, for the most part, situated south of the forty-second degree of latitude. The forests of the whole northern interior portion of the continent, outside the region occupied in the northern Rocky mountains by the eastern development of the Coast Forest, feel the influence of insufficient moisture; the number of species of which they are composed is not large; the individuals are often small and stunted, while the forests are open, scattered, without undergrowth, and confined to the cañons and high slopes of the mountains. The most generally distributed species of this northern region, a scrub pine (*Pinus Murrayana*), occupies vast areas, almost to the exclusion of other species, and is gradually taking possession of ground cleared by fire of more valuable trees. South of the fifty-second parallel the red fir (*Pseudotsuga*) and the yellow pine (*Pinus ponderosa*) appear; with them is associated, in the Blue mountains and in some of the ranges of the northern Rocky mountains, the western larch (*Larix occidentalis*), the largest and most valuable tree of the Columbian basin.

The forest covering the eastern slope of the Sierra Nevada consists almost exclusively of various species of pine, often of great size and value. The characteristic species of this region are the yellow pine and the closely-allied *Pinus Jeffreyi*, here reaching its greatest development. The red fir is absent from this forest, while the oaks, multiplied in many forms on the western slopes of these mountains, have here no representative.

The forests of the southern Rocky Mountain region, less heavy and less generally distributed than those of the western slope of the Sierras, are, as compared with those of the Great Basin, heavy, dense, and valuable. They owe their existence to the comparatively large precipitation of moisture distributed over this elevated region. The characteristic species of the Colorado mountains is a spruce (*Picea Engelmanni*); it forms, at between 8,000 and 10,000 feet elevation, extensive and valuable forests of considerable density and great beauty; with it are associated a balsam fir of wide northern distribution, and various alpine and subalpine species of pine; at lower elevations forests of yellow pine and red fir cover the mountain slopes, while the bottoms of the streams are lined with cottonwood, alder, and maple, or with an open growth of the white fir (*Abies concolor*), a species of the Coast Forest, here reaching the eastern limits of its distribution; the foot-hills above the treeless plain are covered with scant groves of the nut-pine (*Pinus edulis*), stunted junipers, and a small oak, which in many forms extends through a large area of the southern interior region. A forest similar in general features to that of Colorado, and largely composed of the same species, extends over the high mountains of New Mexico to those of western Texas and western and northwestern Arizona, where a heavier forest of pine covers the elevated region lying along the thirty-fifth parallel, culminating in the high forest-clad San Francisco mountains of northern Arizona.

The species of the interior Pacific region mingle along its southern borders with the species peculiar to the plateau of northern Mexico. The Pacific-Mexican Forest, although differing widely in natural features from the Atlantic-Mexican Forest, possesses several species peculiar to the two. The forests of this region are confined to the high mountains and their foot-hills, and to the banks of the rare water-courses. They disappear entirely from the Colorado desert and from the valleys and low mountain ranges of southwestern Arizona. The most important and generally distributed species peculiar to the valleys of this region is the mesquit, the characteristic species of the Atlantic-Mexican region. The suwarrow, however, the great tree cactus, is perhaps the most remarkable species of the region, giving an unusual and striking appearance to the dry *mesas* of central and southern Arizona. The high mountain ranges, extending across the boundary of the United States, between the one hundred and fifth and the one hundred and eleventh meridians, enjoy a larger and more regularly-distributed rainfall than the regions east, and especially west, of these meridians. The forests which cover these southern mountain ranges are often dense and varied. Upon their summits and almost inaccessible upper slopes the firs and pines of

the Pacific region are mingled with pines, a juniper, an arbutus, and various other species peculiar to the Mexican plateau. Extensive forests of a cypress of Mexican origin also characterize this mountain vegetation. The bottoms of the cañons are lined with a dense growth of cottonwood, hackberry, a noble sycamore, an ash, a cherry, and other deciduous trees. The high foot-hills and *mesas* are covered with open groves of various oaks peculiar to the Mexican-Pacific region, here reaching, within the United States at least, their greatest development.

Such are some of the prominent forest features of North America; a dense forest, largely composed, except at the north, of a great variety of broad-leaved species, and extending from the Atlantic sea-board in one nearly unbroken sheet until checked by insufficient moisture from further western development—the forest of the Atlantic region; a forest of conifers, occupying the ranges of the great Cordilleran mountain system, unsurpassed in density in the humid climate of the coast, open and stunted in the arid interior—the forest of the Pacific region.

A more detailed examination of the distribution of North American arborescent genera and species will serve to illustrate the wealth of the forests of the Atlantic and the comparative poverty of those of the Pacific region. It will show, too, more clearly how widely the forests of these two great regions differ in composition.

DISTRIBUTION OF GENERA.

The forests of North America contain arborescent representatives of 158 genera; 142 genera occur in the Atlantic and 59 genera in the Pacific region. Of the Atlantic genera, 48 are not represented in the United States outside the semi-tropical region of Florida.

The following table illustrates the distribution of these genera; the genera of semi-tropical Florida are designated by a *.

| | Genera represented by arbo- rescent species in the Atlantic region. | Genera represented by arbo- rescent species in the Pacific region. | | Genera represented by arbo- rescent species in the Atlantic region. | Genera represented by arbo- rescent species in the Pacific region. |
|--------------------|---|--|----------------------|---|--|
| Magnolia | ✓ | | Eysenhardtia | ✓ | ✓ |
| Liriodendron | ✓ | | Dalca ..... | ..... | ✓ |
| Asimina | ✓ | | Robinia | ✓ | ✓ |
| *Anona | ✓ | | Olneya ..... | ..... | ✓ |
| *Capparis | ✓ | | *Piscidia ..... | ✓ | ..... |
| *Canella | ✓ | | Cladrastis ..... | ✓ | ..... |
| *Cusia | * ✓ | | Sophora ..... | ✓ | ..... |
| Gordonia | ✓ | | Gymnocladus ..... | ✓ | ..... |
| Fremontia | | ✓ | Gleditschia ..... | ✓ | ..... |
| Tilia | ✓ | | Parkinsonia | ✓ | ✓ |
| *Byrsonima | ✓ | | Cercis ..... | ✓ | ..... |
| *Guaiacum | ✓ | | Prosopis | ✓ | ✓ |
| Porlira | ✓ | | Leucaena ..... | ✓ | ..... |
| Xanthoxylum | ✓ | | Acacia | ✓ | ✓ |
| Ptelia | ✓ | ✓ | *Lysiloma ..... | ✓ | ..... |
| Canotia | | ✓ | *Pithecolobium ..... | ✓ | ..... |
| *Simaruba | ✓ | | *Chrysobalanus ..... | ✓ | ..... |
| *Bursera | ✓ | | Prunus | ✓ | ✓ |
| *Amyris | ✓ | | Vauquelinia ..... | ..... | ✓ |
| *Swietenia | ✓ | | Cercocarpus ..... | ..... | ✓ |
| *Ximenia | ✓ | | Pyrus | ✓ | ✓ |
| Ilex | ✓ | | Cratægus | ✓ | ✓ |
| Cyrilla | ✓ | | Heteromeles ..... | ..... | ✓ |
| Cliftonia | ✓ | | Amelanchier ..... | ✓ | ..... |
| Euonymus | ✓ | | Hamamelis ..... | ✓ | ..... |
| *Myrica | ✓ | | Liquidambar ..... | ✓ | ..... |
| *Schæfferia | ✓ | | Rhizophora ..... | ✓ | ..... |
| *Reynosia | ✓ | | *Conocarpus ..... | ✓ | ..... |
| Coudalia | ✓ | ✓ | *Laguncularia ..... | ✓ | ..... |
| Rhamnus | ✓ | ✓ | *Calyptranthes ..... | ✓ | ..... |
| Ceanothus | | ✓ | *Eugenia ..... | ✓ | ..... |
| *Colubrina | ✓ | | Cereus ..... | ..... | ✓ |
| Æsculus | ✓ | ✓ | Cornus | ✓ | ✓ |
| Ungnadia | ✓ | ✓ | Nyssa ..... | ✓ | ..... |
| Sapindus | ✓ | ✓ | Sambucus | ✓ | ✓ |
| *Hypelate | ✓ | | Viburnum ..... | ✓ | ..... |
| Acer | ✓ | ✓ | *Exostemma ..... | ✓ | ..... |
| Negundo | ✓ | ✓ | Pinckneya ..... | ✓ | ..... |
| Rhus | ✓ | | *Genipa ..... | ✓ | ..... |
| Pistacia | ✓ | | *Guettarda ..... | ✓ | ..... |

| | Genera represented by arbo- rescent species in the Atlantic region. | Genera represented by arbo- rescent species in the Pacific region. | | Genera represented by arbo- rescent species in the Atlantic region. | Genera represented by arbo- rescent species in the Pacific region. |
|---------------------|---|--|--------------------|---|--|
| Vaccinium..... | ✓ | | Planera..... | ✓ | |
| Andromeda..... | ✓ | | Celtis..... | ✓ | ✓ |
| Arbutus..... | ✓ | ✓ | *Ficus..... | ✓ | |
| Oxydendrum..... | ✓ | | Morus..... | ✓ | ✓ |
| Kalmia..... | ✓ | | Machura..... | ✓ | |
| Rhododendron..... | ✓ | | Platanus..... | ✓ | ✓ |
| *Myrsine..... | ✓ | | Juglans..... | ✓ | ✓ |
| *Ardisia..... | ✓ | | Carya..... | ✓ | |
| *Jacquinia..... | ✓ | | Myrica..... | ✓ | ✓ |
| *Chrysophyllum..... | ✓ | | Quercus..... | ✓ | ✓ |
| *Sideroxylon..... | ✓ | | Castanopsis..... | | ✓ |
| *Diphollis..... | ✓ | | Castanea..... | ✓ | |
| Bumelia..... | ✓ | ✓ | Fagus..... | ✓ | |
| *Minusops..... | ✓ | | Ostrya..... | ✓ | |
| Diospyros..... | ✓ | | Carpinus..... | ✓ | |
| Symplocos..... | ✓ | | Botula..... | ✓ | ✓ |
| Halesia..... | ✓ | | Alnus..... | ✓ | ✓ |
| Fraxinus..... | ✓ | ✓ | Salix..... | ✓ | ✓ |
| Forestiera..... | ✓ | | Populus..... | ✓ | ✓ |
| Chionanthus..... | ✓ | | Libocedrus..... | | ✓ |
| Osmanthus..... | ✓ | | Thuja..... | ✓ | ✓ |
| Cordia..... | ✓ | | Chamaecyparis..... | ✓ | ✓ |
| *Bourreria..... | ✓ | | Cupressus..... | | ✓ |
| *Ehretia..... | ✓ | | Juniperus..... | ✓ | ✓ |
| Catalpa..... | ✓ | | Taxodium..... | ✓ | |
| Chilopsis..... | ✓ | ✓ | Sequoia..... | | ✓ |
| *Groscentia..... | ✓ | | Taxus..... | ✓ | ✓ |
| *Citharexylum..... | ✓ | | Torreya..... | ✓ | ✓ |
| *Aycenula..... | ✓ | | Pinus..... | ✓ | ✓ |
| *Pisonia..... | ✓ | | Picea..... | ✓ | ✓ |
| *Coccoloba..... | ✓ | | Tsuga..... | ✓ | ✓ |
| Persea..... | ✓ | | Pseudotsuga..... | | ✓ |
| *Nectandra..... | ✓ | | Abies..... | ✓ | ✓ |
| Sassafras..... | ✓ | | Larix..... | ✓ | ✓ |
| Umbellularia..... | | ✓ | Sabal..... | ✓ | |
| *Drypetes..... | ✓ | | Washingtonia..... | | ✓ |
| *Sebastiania..... | ✓ | | *Thrinax..... | ✓ | |
| *Hippomane..... | ✓ | | *Oreodoxa..... | ✓ | |
| Ulmus..... | ✓ | | Yucca..... | ✓ | ✓ |

Arborescent species of 43 genera occur within the limits of the two regions. They are:

| | | | | |
|----------------|--------------|------------|----------------|----------|
| Ptota. | Robinia. | Arbutus. | Quercus. | Taxus. |
| Condalia. | Parkinsonia. | Bumelia. | Botula. | Torreya. |
| Rhus. | Prosopis. | Fraxinus. | Alnus. | Pinus. |
| Acacia. | Acacia. | Chilopsis. | Salix. | Picea. |
| Unguadina. | Prunus. | Celtis. | Populus. | Tsuga. |
| Sapindus. | Pyrus. | Morus. | Thuja. | Abies. |
| Acer. | Crataegus. | Platanus. | Chamaecyparis. | Larix. |
| Negundo. | Cornus. | Juglans. | Juniperus. | Yucca. |
| Bysonchardina. | Sambucus. | Myrica. | | |

The following genera, 44 in number, of the Atlantic region, exclusive of those of semi-tropical Florida, are not represented in the Pacific forest:

| | | | | |
|---------------|--------------|-------------|--------------|-----------|
| Magnolia. | Cliftonia. | Rhizophora. | Forestiera. | Machura. |
| Liriodendron. | Platanus. | Nyssa. | Chionanthus. | Carya. |
| Ashulus. | Cladrastis. | Viburnum. | Osmanthus. | Castanea. |
| Gordonia. | Sophora. | Pinckneya. | Cordia. | Fagus. |
| Tilia. | Gymnocladus. | Andromeda. | Catalpa. | Ostrya. |
| Portiera. | Gleditsia. | Oxydendrum. | Persea. | Carpinus. |
| Xanthoxylum. | Laurencia. | Diospyros. | Sassafras. | Taxodium. |
| Ilex. | Hamamelis. | Symplocos. | Ulmus. | Sabal. |
| Cyrilla. | Liquidambar. | Halesia. | Planera. | |

The following genera of the Atlantic region, 9 in number, are represented in the Pacific flora by one or more frutescent, but by no arborescent, species:

| | | | |
|-----------|--------------|------------|---------------|
| Euonymus. | Amelanchier. | Vaccinium. | Rhododendron. |
| Rhus. | Viburnum. | Kalmia. | Forestiera. |
| Cercis. | | | |

Ptelia, *Condalia*, *Sapindus*, *Robinia*, *Bumelia*, *Celtis*, *Morus*, and *Juglans*, genera reaching their greatest development in North America in the Atlantic region, extend with a single arborescent representative into the Pacific region. *Rhamnus*, *Aesculus*, *Acer*, *Negundo*, *Prunus*, *Pyrus*, *Crataegus*, *Cornus*, *Sambucus*, *Fraxinus*, *Platanus*, *Myrica*, *Quercus*, *Betula*, *Alnus*, *Salix*, *Populus*, *Thuja*, *Chamaecyparis*, *Juniperus*, *Taxus*, *Torreya*, *Pinus*, *Picea*, *Tsuga*, *Abies*, and *Larix*, characteristic North American genera, are widely represented in the two regions.

Ungnadia, *Eysenhardtia*, *Parkinsonia*, *Prosopis*, *Acacia*, *Chilopsis*, and *Yucca*, genera of the Mexican flora, are common to the two regions.

Arbutus, a genus of the Pacific region, just reaches, with a doubtful species, the Atlantic region through western Texas.

The following genera of the Pacific region, 13 in number, have no representatives in the Atlantic region:

| | | | |
|--------------|---------------|--------------|---------------|
| Fremontia. | Cercocarpus. | Castanopsis. | Sequoia. |
| Canotia. | Heteromeles. | Libocedrus. | Pseudotsuga. |
| Olneya. | Umbellularia. | Cupressus. | Washingtonia. |
| Vauquelinia. | | | |

The following genera of the Pacific, 3 in number, are represented in the Atlantic region by frutescent species:

| | | |
|------------|--------|---------|
| Ceanothus. | Dalea. | Cereus. |
|------------|--------|---------|

The Atlantic forest, exclusive of semi-tropical Florida, contains 45 genera entirely unrepresented in the Pacific region and 7 genera without Pacific arborescent representatives. The Pacific forest contains 13 genera unrepresented in the Atlantic region and 3 genera without Atlantic arborescent representatives.

The following genera of the Mexican region, 14 in number, are not elsewhere represented in North America. Genera with arborescent representatives in both the Atlantic and Pacific-Mexican regions are designated by a star (*):

| | | | | |
|------------|----------------|---------------|--------------|---------------|
| Porlieria. | Pistacia. | Olneya. | Acacia. | *Chilopsis. |
| Canotia. | *Eysenhardtia. | *Parkinsonia. | Vauquelinia. | Washingtonia. |
| *Ungnadia. | Dalea. | Leucaena. | Cereus. | |

Porlieria and *Leucaena* belong to the Atlantic; *Canotia*, *Dalea*, *Olneya*, *Vauquelinia*, *Cereus*, and *Washingtonia* to the Pacific region.

DISTRIBUTION OF SPECIES.

In the forests of North America 412 arborescent species have been detected; of these, 292 species belong to the Atlantic region, and 153 occur within the limits of the Pacific region. Species common to the two regions are rare; they are principally confined to the subarctic Northern Forest and to the narrow belt along the southern boundary of the United States.

The following species, 10 in number, cross the continent:

| | | | | |
|---------------------|--------------------|----------------------|-----------------------|----------------|
| Prosopis juliflora. | Sambucus Mexicana. | Salix longifolia. | Populus balsamifera. | Picea alba. |
| Pyrus sambucifolia. | Betula papyrifera. | Populus tremuloides. | Juniperus Virginiana. | Yucca baccata. |

Prosopis juliflora, *Sambucus Mexicana*, and *Yucca baccata* belong to the Mexican flora of the south; *Salix longifolia* also belongs here, although extending northward into the Atlantic and through the Pacific Coast region of the United States. *Populus balsamifera*, *Betula papyrifera*, and *Picea alba* belong to the Northern Forest. *Pyrus sambucifolia*, *Populus tremuloides* and *Juniperus Virginiana* are widely distributed through the central portions of the Atlantic and Pacific regions; they are the only really continental arborescent species.

The following species of the Atlantic region, 15 in number, extend from the Atlantic into the Pacific region:

| | | | |
|----------------------|-----------------------|----------------------|-----------------|
| Ptelia trifoliata. | Negundo aceroides. | Crataegus tomentosa. | Quercus Emoryi. |
| Condalia obovata. | Parkinsonia aculeata. | Fraxinus viridis. | Alnus incana. |
| Sapindus marginatus. | Prunus Americana. | Celtis occidentalis. | Salix nigra. |
| Ungnadia speciosa. | Prunus Pennsylvanica. | Morus microphylla. | |

Ptelia trifoliata, a widely distributed species of the Atlantic region, extends through western Texas into the extreme southeastern portion of the Pacific region. *Condalia obovata*, *Ungnadia speciosa*, *Parkinsonia aculeata*, *Morus microphylla*, and *Quercus Emoryi*, of the Atlantic-Mexican forest, extend into the Pacific-Mexican region. *Sapindus marginatus*, of the southern Atlantic region, extends through western Texas to the Pacific-Mexican region. *Prunus Americana*, *Prunus Pennsylvanica*, and *Alnus incana*, widely distributed through the northern portions of the Atlantic region, just reach the eastern limits of the central Pacific region.

Negundo aceroides, *Crataegus tomentosa*, *Fraxinus viridis*, and *Celtis occidentalis* are widely distributed through the interior Pacific region, although nowhere reaching the coast.

The following species of the Pacific region, 8 in number, extend through the Mexican into the Atlantic region :

| | | | |
|---------------------------------|--------------------------------|---------------------------|--------------------------------|
| <i>Eysenhardtia orthocarpa.</i> | <i>Acacia Greggii.</i> | <i>Chilopsis saligna.</i> | <i>Juniperus occidentalis.</i> |
| <i>Prosopis pubescens.</i> | <i>Fraxinus pistaciæfolia.</i> | <i>Juglans rupestris.</i> | <i>Juniperus pachyphloea.</i> |

Juglans rupestris and *Juniperus occidentalis* reach their greatest development in the Pacific Coast region, and extend through the Pacific-Mexican region into western Texas; no other species are common to the Pacific Coast forest and the Atlantic-Mexican region. The 6 remaining Pacific-Atlantic species belong to the Pacific-Mexican region, just reaching western Texas.

The following species of the Southern Pacific region extends into the Atlantic region :

Salix amygdaloides.

The following species of the Pacific forest, 12 in number, endemic to the interior arid region, do not extend beyond its limits :

| | | | |
|--------------------------------|----------------------------|------------------------------|--------------------------|
| <i>Acer grandidentatum.</i> | <i>Cratægus rivularis.</i> | <i>Populus angustifolia.</i> | <i>Pinus monophylla.</i> |
| <i>Robinia Neo-Mexicana.</i> | <i>Fraxinus anomala.</i> | <i>Pinus flexilis.</i> | <i>Picea pungens.</i> |
| <i>Cercocarpus ledifolius.</i> | <i>Quercus undulata.</i> | <i>Pinus edulis.</i> | <i>Yucca brevifolia.</i> |

A detailed examination of the distribution of the arborescent species composing the North American forests shows that—

Magnolia is represented by seven Atlantic species, with the center of its distribution in the southern Alleghany region.

Liriodendron is represented by a single species, widely-distributed through the eastern and central portions of the Atlantic region.

Asimina is represented by a single widely-distributed arborescent species and by three frutescent species of the Atlantic region.

Anona, *Capparis*, *Canella*, and *Clusia* are represented each by a single semi-tropical species.

Gordonia is represented by two species of the southern Atlantic region, one of wide distribution, the other rare and local.

Fremontia, a genus endemic to the Pacific region, is represented by a single species of the southern Pacific Coast region.

Tilia is represented by two Atlantic species, with its center of distribution in the southern Alleghany region.

Byrsionima is represented by a single semi-tropical species.

Guaiacum is represented by a single semi-tropical species.

Portiera is represented by a single species of the Atlantic-Mexican region.

Xanthoxylum is represented by two species of the Atlantic region, by a semi-tropical species, and by a second semi-tropical species which reaches the Atlantic-Mexican region.

Ptelia is represented by a single arborescent species of wide distribution in the Atlantic, reaching also the Pacific region, where a frutescent species occurs, and by a second frutescent species of the south Atlantic region.

Canotia, a genus endemic to the Pacific-Mexican region, is represented by a single species.

Simaruba, *Amyris*, *Swietenia*, *Ximenia*, are each represented by a single semi-tropical species.

Bursera is represented by a single semi-tropical species and by a second frutescent species of the Pacific-Mexican region.

Ilex, an Atlantic genus, is represented by four arborescent and several frutescent species, with its center of distribution in the southern Atlantic region.

Cyrtilla and *Cliftonia* are each represented by a single species of the southern Atlantic region.

Euonymus is represented by a widely-distributed arborescent species in the Atlantic, and by a frutescent species in both the Atlantic and the Pacific regions.

Myginda, *Schæfferia*, and *Reynosia* are each represented by a single semi-tropical species.

Condalia is represented by one semi-tropical and by one species of the Atlantic-Mexican reaching the Pacific-Mexican region.

Rhamnus is represented by one arborescent and by one frutescent species in the Atlantic, by two arborescent and one frutescent species in the Pacific region, and by one frutescent species common to the two regions.

Ceanothus is represented by a single arborescent species in the Pacific Coast region and by several frutescent species widely distributed through the Atlantic and the Pacific regions.

Colubrina is represented by a single semi-tropical species.

Æsculus is represented by two arborescent and by three frutescent species in the Atlantic, and by an arborescent species in the Pacific region.

Ungadia, an endemic genus of the Atlantic-Mexican region, and just reaching the Pacific-Mexican region, is represented by a single species.

Sapindus is represented by one species widely distributed through the southern Atlantic, and reaching the Pacific region, and by one semi-tropical species.

Acer is represented by five Atlantic and four Pacific species.

Negundo is represented by one species widely distributed through the Atlantic and the Pacific regions and by a second species in the Pacific region.

Rhus is represented by five arborescent species in the Atlantic and by several frutescent species in both the Atlantic and the Pacific regions.

Pistacia is represented by a single species in the Atlantic-Mexican region.

Eysenhardtia is represented by a single arborescent species in the Pacific-Mexican, extending into the Atlantic-Mexican region, where a second frutescent species occurs.

Dalea is represented by a single arborescent species in the Pacific-Mexican and by numerous frutescent and herbaceous species in the Atlantic and the Pacific regions.

Robinia, with its center of distribution in the southern Alleghany region, is represented by two arborescent and one frutescent species in the Atlantic and by one arborescent species in the Pacific region.

Olneya, an endemic genus of the Pacific-Mexican region, is there represented by a single species.

Piscidia is represented by a single semi-tropical species.

Cladrastis is represented by a single local species in the southern Atlantic region.

Sophora is represented by a species in the southern Atlantic and by a second species in the Atlantic-Mexican region, and by four frutescent or suffrutescent species.

Gymnocladus is represented by a single species in the central Atlantic region.

Gleditschia is represented by two widely-distributed species in the Atlantic region.

Parkinsonia is represented by an arborescent species common to the Atlantic and the Pacific-Mexican regions, by two arborescent and one frutescent species in the Pacific-Mexican, and by a frutescent species in the Atlantic-Mexican region.

Cercis is represented by a widely-distributed species in the Atlantic, by a second species in the Atlantic-Mexican, and a frutescent species of the California Coast region.

Prosopis is represented by two arborescent species common to the Atlantic and the Pacific-Mexican regions, and by two frutescent species.

Leucaena is represented by two species in the Atlantic-Mexican region.

Acacia is represented by two arborescent species in the Atlantic-Mexican, by one arborescent species of the Pacific-Mexican extending into the Atlantic-Mexican region, and by several frutescent species widely distributed through the two regions.

Lysiloma is represented by a single semi-tropical species.

Pithecolobium is represented by a single polymorphous arborescent species of semi-tropical Florida, and by a shrubby species of the Mexican Boundary region.

Chrysobalanus is represented by one arborescent and one frutescent semi-tropical species.

Prunus is represented by seven arborescent species in the Atlantic region; of these, one is semi-tropical and two extend into the Pacific region. This genus is represented in the Pacific region by four species, of which one belongs to the Mexican region, and by several frutescent species.

Vauquelinia, an endemic genus of the Pacific-Mexican region, is there represented by a single species.

Cercocarpus is represented by two widely-distributed species in the Pacific region.

Pyrus is represented by one species common to both Atlantic and Pacific, by three arborescent and one frutescent species in the Atlantic, and by one arborescent species in the Pacific region.

Crataegus is represented by twelve arborescent and frutescent species in the Atlantic, of which one extends into the Pacific region, and by two species in the Pacific region.

Heteromeles is represented by a single species in the Pacific Coast region.

Amelanchier is represented by one arborescent species in the Atlantic and by one frutescent species in the Pacific region.

Hamamelis and *Liquidambar* are each represented by one widely-distributed species in the Atlantic region.

Rhizophora is represented by a single species in the southern Atlantic region.

Conocarpus, *Laguncularia*, and *Calyptanthus* are each represented by a single semi-tropical species.

Eugenia is represented by five semi-tropical species.

Cereus is represented by a single arborescent species in the Pacific and by several frutescent species in the Atlantic and Pacific regions.

Cornus is represented by two arborescent species in the Atlantic, by a single arborescent species in the Pacific region, and by several frutescent and herbaceous species in the two regions.

Nyssa is represented by three species in the Atlantic region.

Sambucus is represented by one arborescent species of wide distribution in the Pacific, by one species in the Pacific-Mexican extending into the Atlantic-Mexican, by a frutescent species in the Atlantic, by a second frutescent species in the Pacific, and by a frutescent species common to the Atlantic and Pacific regions.

Viburnum is represented by two arborescent species in the Atlantic and by several frutescent species in the Atlantic and the Pacific regions.

Erotemma is represented by a single semi-tropical species.

Pinckneya, an endemic genus of the southern Atlantic region, is there represented by a single species.

Genipa is represented by a single semi-tropical species.

Quettarda is represented by one arborescent and by one frutescent semi-tropical species.

Vaccinium is represented by one arborescent species in the Atlantic and by several frutescent species in the Atlantic and the Pacific regions.

Andromeda is represented by an arborescent and several frutescent species in the Atlantic region.

Arbutus is represented by one species in the Pacific Coast, by a second species in the Pacific-Mexican, and by one species in the Atlantic-Mexican region.

Oxydendrum, an endemic genus of the Atlantic region, is there represented by a single species.

Kalmia is represented by one arborescent species and by three frutescent species in the Atlantic region, of which one extends to the Pacific region.

Rhododendron is represented by one arborescent and by several frutescent species in the Atlantic and by several frutescent species in the Pacific region.

Myrsine, *Ardisia*, *Jacquinia*, *Chrysophyllum*, *Sideroxylon*, and *Dipholis* are each represented by a single semi-tropical species.

Bumelia is represented by four species in the Atlantic and by one species in the Pacific-Mexican region.

Mimusops is represented by one semi-tropical species.

Diospyros is represented by one species in the Atlantic and by one in the Atlantic-Mexican region.

Symplocos is represented by one species in the southern Atlantic region.

Halesia is represented by two arborescent and by one frutescent species in the southern Atlantic region.

Fraxinus, with its center of distribution in the southern Atlantic region, is represented by seven species in the Atlantic, of which one extends into the Pacific region, and one belongs to the Mexican region, and by three arborescent and one frutescent species in the Pacific, of which one belongs to the Mexican region.

Forestiera is represented by one arborescent and seven frutescent species in the Atlantic region, of which one reaches the Mexican-Pacific region.

Chionanthus and *Osmanthus* are each represented by a single species in the southern Atlantic region.

Cordia is represented by one arborescent and by one frutescent semi-tropical species and by one arborescent and one frutescent species in the Atlantic-Mexican region.

Bourreria and *Ehretia* are each represented by a single semi-tropical species.

Catalpa is represented by two species in the southern Atlantic region.

Chilopsis is represented by a single species in the Pacific-Mexican region, extending into the Atlantic-Mexican region.

Crescentia, *Citharexylum*, and *Aricemnia* are each represented by a single semi-tropical species.

Pisonia is represented by one arborescent and by two frutescent semi-tropical species.

Coccoloba is represented by two semi-tropical species.

Persca is represented by one species in the southern Atlantic region.

Nectandra is represented by one semi-tropical species.

Sassafras is represented by one widely-distributed species in the Atlantic region.

Umbellularia is represented by a single species in the Pacific Coast region.

Drypetes, *Sebastiania*, and *Hippomane* are each represented by a single semi-tropical species.

Ulmus, with its center of distribution in the Mississippi basin, is represented in the Atlantic region by five species.

Planera is represented by a single species in the southern Atlantic region.

Celtis is represented by a single polymorphous species of wide distribution in the Atlantic region, extending into the Pacific region, and by a frutescent species common to the Atlantic-Mexican and the Pacific-Mexican regions.

Picus is represented by three semi-tropical species.

Morus is represented by one widely-distributed species in the Atlantic region, and by one species in the Atlantic-Mexican, extending into the Pacific-Mexican region.

Maclura is represented by a single local species in the southern Atlantic region.

Platanus is represented by one widely-distributed species in the Atlantic region, by a species in the Pacific coast, and by a species in the Pacific-Mexican region.

Juglans is represented by two widely-distributed species in the Atlantic region and by a species in the Pacific coast, extending through the Pacific-Mexican into the Atlantic-Mexican region.

Carya, an endemic genus of the Atlantic region, with its center of distribution west of the Mississippi river, is represented by seven species.

Myrica is represented by one arborescent and two frutescent species in the Atlantic region and by one arborescent species in the Pacific Coast region.

Quercus, with its center of most important distribution in the basin of the lower Ohio river, is represented in the Atlantic region by twenty-four arborescent species, of which one, belonging to the Mexican region, extends into the Pacific-Mexican region; and in the Pacific region by twelve arborescent species, of which one belongs to the interior and four to the Mexican region, and by two frutescent species.

Castanopsis is represented by a single species in the Pacific Coast region.

Castanea is represented by two species in the Atlantic region.

Fagus, *Ostrya*, and *Carpinus* are each represented by a single widely-distributed species in the Atlantic region.

Betula, with its center of distribution in the northern Atlantic region, is represented by one arborescent and by one frutescent species common to the Atlantic and the Pacific regions, by four arborescent and one frutescent species in the Atlantic region, and by one arborescent species in the Pacific region.

Alnus is represented by three arborescent species in the Atlantic, of which one extends to the Pacific region, by three arborescent species in the Pacific region, and by two frutescent species common to the Atlantic and the Pacific regions.

Salix is represented in the Atlantic region by five arborescent species, of which three are found in the Pacific region, and by many frutescent species. This genus is represented in the Pacific region by ten arborescent and by many frutescent species.

Populus is represented by two species common to the Atlantic and the Pacific regions, by three species in the Atlantic region, and by three species in the Pacific region.

Libocedrus is represented by a single species in the Pacific Coast region.

Thuja is represented by one species in the Atlantic and by one species in the Pacific region.

Chamaecyparis is represented by one species in the Atlantic and by two species in the Pacific Coast region.

Cupressus is represented by four species in the Pacific region, of which three occur in the coast and one in the Mexican region.

Juniperus is represented by one arborescent species in the Atlantic region, by three arborescent species in the Pacific, of which one belongs to the Pacific-Mexican and one extends to the Atlantic-Mexican region, and by two frutescent species common to both regions.

Taxodium is represented by a single species in the southern Atlantic region.

Sequoia, an endemic genus of the Pacific Coast region, is there represented by two species.

Taxus is represented by an exceedingly local arborescent species in the southern Atlantic region, by a frutescent species in the northern Atlantic region, and by an arborescent species in the Pacific Coast region.

Torreya is represented by a single exceedingly local arborescent species in the southern Atlantic region and by a single species in the Pacific Coast region.

Platanus, with its center of distribution in the southern Pacific Coast region, is represented by thirteen species in the Atlantic and by twenty-two species in the Pacific region, of which three belong to the interior and four to the Mexican region.

Picea is represented by one species common to the Atlantic and the Pacific regions, by one species in the Atlantic, and by three species in the Pacific region, of which one belongs to the interior region.

Tsuga is represented by two species in the Atlantic and by two species in the Pacific region.

Pseudotsuga, an endemic genus of the Pacific region, is there represented by a single widely-distributed species.

Abies is represented by one widely-distributed and by one exceedingly local species in the Atlantic region and by seven species in the Pacific region, of which one is exceedingly local.

Larix is represented by one species in the Atlantic and by two species in the Pacific region.

Sabal is represented by a single species in the southern Atlantic region.

Washingtonia is represented by a single species in the Pacific Mexican region.

Thrinax is represented by two semi-tropical species, and *Oreodoxa* by one.

Yucca is represented by one arborescent and one frutescent species common to the Atlantic and the Pacific regions, by one arborescent and by two frutescent species in the Atlantic, and by two arborescent and by one frutescent species in the Pacific region.